What is claimed is:

[Claim 1] 1. A brake booster having a wall that moves within a cavity of a housing in response to a pressure differential to produce an output force as a function of an input force communicated from an input member to a control valve arrangement, said output force being transmitted through a hub for said wall to an output member to effect a desired brake application, said brake booster being characterized in that said hub includes a first cylindrical member having a first stepped bore that extends between a first end and a second end for receiving a second cylindrical member with a second stepped bore therein that extends between a first end to a second end, said first stepped bore having first and second longitudinal slots that extend from said first end toward said second end, said second cylindrical member having third and fourth longitudinal slots there through that extend from said second stepped bore and are located in a same plane between said first end and said second end thereof, said second cylindrical member having first and second lateral openings with respect to the axis of said second cylindrical member and that are normal to said third and fourth longitudinal slots; a plunger of said control valve arrangement having a shaft that is located in said second stepped bore with a first end positioned adjacent said second end of said second cylindrical body, said shaft having a fifth longitudinal slot there through and first and second lateral oval openings that extend from and are normal to said fifth longitudinal slot, a gear having an axle aligned with said first and second lateral openings in said second cylindrical body and with said first and second oval openings in said plunger, a pin that passes through said first and second oval openings and is retained in said first and second lateral openings such that teeth on a peripheral surface of said gear extend through said third and fourth longitudinal slots and into said first and second longitudinal slots, a first rack located in said first longitudinal slot and engaging a first plurality of said teeth on said gear and a second rack located in said second longitudinal slot and engaging a second plurality of said teeth on said gear, said second rack being fixed to said housing while a clip member attached to said first cylindrical member provides a stop to prevent said first rack from moving past

said first end of said first cylindrical member, said first cylindrical member and said wall moving together during a brake application such that on said first rack engaging said clip a rotative torque is imparted to said first plurality of teeth of said gear that causes said gear to rotate about said pin and move said second plurality of teeth with respect to said second rack such that said second cylindrical member separates from said first cylindrical member and as a result the travel of said input member is about one-half of the travel of said output member.

[Claim 2] 2. The brake booster as recited in claim 1 wherein said output member is characterized by a first piston that is directly connected to said first cylindrical member and located in a bore of a master cylinder for creating operational pressurizing fluid in a pressurizing bore of the master to effect a brake application.

[Claim 3] 3. The brake booster as recited in claim 2 wherein said first piston is characterized by an axial bore that is connected to said pressurizing bore in said master cylinder and receives operational pressurized fluid from which a reaction force is created to oppose the input force applied to the input member.

[Claim 4] 4. The brake booster as recited in claim 3 wherein said brake booster is further characterized by a second piston that is located in said axial bore of said first piston and receives said operational pressurized fluid from which a reaction force is created that acts on the first end of said second cylindrical member to oppose the input force during a brake application.

[Claim 5] 5. The brake booster as recited in claim 4 wherein said brake booster is further characterized by a reaction disc that is located in said first stepped bore between said second piston and the first end of said second cylindrical member to uniformly oppose the input force.

[Claim 6] 6. The brake booster as recited in claim 5 wherein said first and second oval openings have a length that corresponds to a distance that a seat on said plunger of the input member moves from a position of rest to an

actuation position to allow air to be communicated to a chamber to create said pressure differential.

[Claim 7] 7. The brake booster as recited in claim 1 wherein said input force is carried into said gear through said pin to manually move said first cylindrical member to assist in effecting said brake application.

[Claim 8] 8. The brake booster as recited in claim 7 wherein said movement of said first cylindrical member through said pin causes said gear to rotate about said pin causing said first plurality of teeth to move said first rack into said first longitudinally slot while said second plurality of teeth move on said second rack such that said second cylindrical member remains engaged with said first cylindrical member and as a result the travel of said input member equal the travel of said output member.

[Claim 9] 9. The brake booster as recited in claim 7 wherein said input force acts through said second piston to pressurize operational fluid in said axial bore of said first piston to further pressurize the operational pressurized fluid during a brake application.

[Claim 10] 10. A brake booster having a wall that moves within a cavity of a housing in response to a pressure differential to produce an output force that is a function of an input force communicated from an input member to a control valve arrangement to effect a desired brake application, said brake booster being characterized in that said wall includes a first cylindrical member with a first stepped bore therein that receives a second cylindrical member with a second stepped bore therein that receives a plunger, said first cylindrical member having first and second longitudinal slots that extend from a first end of said first stepped bore toward a second end, said second cylindrical member having third and fourth longitudinal slots therein that extend from said second stepped bore between a first end and a second end thereof, said second cylindrical member having first and second lateral openings therein located along the axis of said second cylindrical member that are normal to said third and fourth longitudinal slots; said plunger having a shaft that is located in said second stepped bore with a reaction end

positioned adjacent said first second end of said second cylindrical body, said shaft having a fifth longitudinal slot there through with first and second lateral oval openings that extend from and are normal to said fifth longitudinal slot, a gear having an axle aligned with said first and second lateral openings in said second cylindrical body and with said first and second oval openings in said plunger, a pin that passes through said first and second oval openings and is retained in said first and second lateral openings such that teeth on a peripheral surface of said gear extend through said third and fourth longitudinal slots and into said first and second longitudinal slots, a first rack located in said first longitudinal slot and engaging a first plurality of said teeth on said gear and a second rack located in said second longitudinal slot and engaging a second plurality of said teeth on said gear, said second rack being fixed to said housing while said first rack engages a stop to retain said first rack in said first longitudinal slot, said first cylindrical member and said wall moving together during a brake application such that said first rack to imparts a rotative torque through said first plurality of teeth on said gear that causes said gear to rotate about said pin and move said second plurality of teeth on said second rack such that said second cylindrical member separates from said first cylindrical member and as a result the travel of said input member is less than the travel of said output member.

[Claim 11] 11. The brake booster as recited in claim 10 wherein said output member is characterized by a first piston attached to said first cylindrical member and located in a bore of a master cylinder for creating operational pressurizing fluid in a pressurizing bore of the master to effect a brake application.

[Claim 12] 12. The brake booster as recited in claim 11 wherein said first piston is characterized by a passage that is connected to said pressurizing bore in said master cylinder to receive operational pressurized fluid from which a reaction force is created to oppose the input force applied to the input member.

[Claim 13] 13. The brake booster as recited in claim 12 wherein said brake booster is further characterized by a second piston that is located in said passage of said first piston that receives said operational pressurized fluid, said operational pressurized fluid acting on said second piston to produce said reaction force that acts on the second ends of said first and second cylindrical members to oppose the input force during a brake application.

[Claim 14] 14. The brake booster as recited in claim 13 wherein said brake booster is further characterized by a reaction disc that is located in said first stepped bore between said second piston and the first end of said first cylindrical member and said second end of said second cylindrical members to uniformly apply the reaction force between the first and second ends in opposing the input force.

[Claim 15] 15. The brake booster as recited in claim 14 wherein said first and second oval openings have a length that corresponds to a distance equal to a distance that a seat on said plunger of the input member moves from a position of rest to an actuation position where air is communicated to a chamber to create said pressure differential.

[Claim 16] 16. The brake booster as recited in claim 10 wherein said input force is carried into said gear through said pin to manually move said first cylindrical member and assist in effecting said brake application.

[Claim 17] 17. The brake booster as recited in claim 16 wherein said movement of said first cylindrical member through said pin causes said gear to rotate about said pin and said first plurality of teeth to move said first rack into said first longitudinally slot while said second plurality of teeth move on said second rack such that said second cylindrical member remains engaged with said first cylindrical member and as a result the travel of said input member is about equal the travel of said output member.

[Claim 18] 18. A valve arrangement for a brake booster, said brake booster having a wall connected to a first cylindrical member having a first

stepped bore therein, a second cylindrical member located in the first stepped bore and having a second stepped bore therein, a plunger located in the second stepped bore and connected to an input member, said first cylindrical member having first and second longitudinal slots that extend from a first end toward a second end thereon, said second cylindrical member having third and fourth longitudinal slots that extend from said second cylindrical bore, a gear fixed to the second cylindrical member and having a first plurality of teeth that extend through said third longitudinal slot and engage a first rack retained in said first longitudinal slot and a second plurality of teeth that extend through said fourth longitudinal slot and engage a second rack located within said second longitudinal slot, said second rack being fixed to a housing for the brake booster, said input member applying a force to move said plunger and control the development of a pressure differential that moves said wall to produce an output force that is used to effect a brake application, said wall on moving transmitting a torque through said first rack into said first plurality of teeth such that said gear rotates and moves said second plurality of teeth on said second rack and as a result said second cylindrical member moves away from said first cylindrical body as the travel of input member is less than the travel of the wall during the brake application.

[Claim 19] 19. The brake booster as recited in claim 18 wherein said output member is characterized by a first piston attached to said first cylindrical member and located in a bore of a master cylinder for creating operational pressurizing fluid in a pressurizing bore of the master to effect a brake application, said first piston having a passage that is connected to said pressurizing bore to receive operational pressurized fluid, and a second piston that is located in said passage and receives said operational pressurized fluid to produce a reaction force that acts on the second end of said second cylindrical members to oppose said input force during a brake application.

[Claim 20] 20. The brake booster as recited in claim 19 wherein said brake booster is further characterized by said input member moving said first rack in said first longitudinally slot through rotation of said gear to prevent

separation of said second cylindrical member from said first cylindrical member and thereby manually move said wall to effect a brake application.

[Claim 21] 21. A brake booster having a wall that moves within a cavity of a housing in response to a control valve arrangement terminating communication of a first fluid between a first chamber and a second chamber while allowing a second fluid to be communicated to the second chamber to create a pressure differential and thereby produce an output force that is a function of an input force applied to an input member, said output force being transmitted through a hub for said wall to an output member to effect a desired brake application, said brake booster being characterized in that said wall includes a first cylindrical member having a first stepped bore that retains a second cylindrical member with a second stepped bore that retains a shaft that extends from a plunger connected to said input member, said first cylindrical member, second cylindrical member and shaft having longitudinal slots therein with oval openings in said plunger and lateral openings in said second cylindrical member that are normal to said longitudinal slots; a gear having an axle aligned with said lateral openings in said second cylindrical member and with said oval openings in said plunger, a pin that passes through said oval openings and is retained in said lateral openings such that teeth on a peripheral surface of said gear extend through said longitudinal slots and engage a first rack carried by said first cylindrical member and a second rack fixed to said housing, said first cylindrical member and said wall moving together during a brake application such that said first rack imparts a rotate torque on said gear such that said gear rotates about said pin and moves on said second rack and said second cylindrical member separates from said first cylindrical member and as a result the travel of said input member is less than the travel of said output member; and tubular means fixed said first cylindrical member and sealingly connected to said second cylindrical member such that when said first and second cylindrical members separate said communication is maintained between said first chamber and a seat in said second cylindrical member through which said first chamber is connected to said second chamber.

[Claim 22] 22. The brake booster as recited in claim 21 wherein said first cylindrical member is characterized by a first passage through which said second chamber is connected to said second fluid.

[Claim 23] 23. The brake booster as recited in claim 22 wherein said second cylindrical member is characterized by a second passage that receives said tubular means for communicating the first fluid to said seat.

[Claim 24] 24. A brake booster having a wall that moves within a cavity of a housing in response to a control valve arrangement terminating communication of a first fluid between a first chamber and a second chamber while allowing a second fluid to be communicated to the second chamber to create a pressure differential and thereby produce an output force as a function of an input force applied to an input member, said output force being transmitted through a hub for said wall to an output member to effect a desired brake application, said brake booster being characterized in that said wall includes a first cylindrical member having a first stepped bore that retains a second cylindrical member with a second stepped bore that retains a shaft that extends from a plunger connected to said input member, said first cylindrical member, second cylindrical member and shaft having longitudinal slots therein and oval openings in said plunger and lateral openings in said second cylindrical member that are normal to said longitudinal slots; a gear having an axle aligned with said lateral openings in said second cylindrical member and with said oval openings in said plunger, a pin that passes through said oval openings and is retained in said lateral openings such that teeth on a peripheral surface of said gear extend through said longitudinal slots and engage a first rack carried by said first cylindrical member and a second rack fixed to said housing, said first cylindrical member and said wall moving together during a brake application such that said first rack imparts a rotative torque that rotates said gear about said pin and moves said gear on said second rack such that said second cylindrical member separates from said first cylindrical member and as a result the travel of said input member is less than the travel of said output member; and tubular means fixed said first cylindrical member and sealingly connected to said second cylindrical member such that

with separation of said second cylindrical member and said first cylindrical member communication is maintained between said first chamber and a seat in said second cylindrical member.

[Claim 25] 25. The brake booster as recited in claim 24 wherein a ratio of travel of said input member and said output member is proportional to said input force and said output force.